FINAL FEASIBILITY REPORT
ON
FLOOD DAMAGE REDUCTION
AND ECOSYSTEM RESTORATION
FEASIBILITY STUDY
WOODBRIDGE RIVER BASIN,
MIDDLESEX COUNTY, NEW JERSEY

APPENDIX C

ENGINEERING DESIGN

WOODBRIDGE RIVER FLOOD CONTROL

FEASIBILITY STUDY

WOODBRIDGE TOWNSHIP, NEW JERSEY

APPENDIX C

ENGINEERING DESIGN

TABLE OF CONTENTS

DRAWINGS

Project Description for Storm Damage Reduction

A1. The project area is located in the watershed of the Woodbridge River in Middlesex County, New Jersey, in Woodbridge Township. Alternatives include:

100-year level-of-protection:

Alternative 1: Non-structural measures not covered in this section.

Alternative 2: Non-structural protection to approximately 189 homes in the Ideal Mobile Home Community and a floodwall built around the Crampton Avenue neighborhood, including raising Port Reading Road.

Alternative 3: Floodwalls to be built around the Ideal Mobile Home Community and the Crampton Avenue neighborhood, including raising Port Reading road.

Alternative 4: Tide Gate upstream of Woodbridge Avenue and levee system along the New Jersey Turnpike embankment.

50-year level-of-protection

Alternative 5: Levee alignment A - Tide Gate at the downstream end of the New Jersey Turnpike bridge and levee system to prevent flanking.

Alternative 6: Levee alignment B - Tide Gate just upstream of the Woodbridge Avenue bridge and levee system to prevent flanking.

A2. All alternatives were laid out using topographic mapping from March 1962. These alignments were later overlain on aerial photographs taken in 2002, which revealed many changes in the topography, including relocation of the Woodbridge River and the widening of the New Jersey Turnpike. The levee and floodwall alignments were then adjusted to account for these changes. Although the figures included herein are shown on the old topographic mapping, the alignments reflect the changes in topography.

A3. **Crampton Avenue Floodwall** A floodwall has been proposed around the Crampton Avenue neighborhood, shown in figure C-106. The floodwall starts at the Port Reading Avenue Bridge and would be built to an elevation of 12.0 feet (NGVD) to provide protection from a 100-year tide condition. Port Reading Avenue would be raised to accommodate the height of the floodwall. The road will be raised to an elevation of 12.0 feet (NGVD). In order to minimize the impact on the surrounding wetlands, the floodwall will follow closely behind the properties along Watson and Crampton Avenues. It then turns to the West and ties into the end of Green Street. The length of this wall is approximately 4,560 feet. See Figure C-106.

A4. **Rahway Avenue Floodwall** Another floodwall is proposed around the Ideal Mobile Home Park on Rahway Avenue. The top of this wall would also be at elevation 12.0 feet (NGVD) for the 100-year level of protection. The alignment of the floodwall begins at Marriott Avenue and goes east, turning south along the Woodbridge River to tie into the railroad embankment. The Rahway floodwall would be 2,000 feet in length. See Figure C-105.

A5. **Tide Gate and Levee.** The tide gate/levee system is located just upstream of the Woodbridge Avenue bridge and runs perpendicular to the Woodbridge River. It consists of a tide gate with

sluice gates and a levee tying into the 12.0-foot (NGVD) contour. The levee alignments are shown in figures C-101 through C-104. Figures C-104 and C-104a shows Levee alignment "B", which provides 50-year interior flood protection. The levee alignment in this alternative would be 924 feet long, not including the tide gate. This has proven to be the most economically feasible alternative.
Figure C-103 shows the 50-Year Level of Protection, Levee Alignment "A", which is 1,074 feet long. This alternative would not protect the adjacent sewage pumping station facility, so it was not chosen as the preferred alternative. Additionally, as shown in figures C-101 and C-102, an alternative is provided for the 100-year level of protection. For this alternative, the top of levee and tide gate is at elevation 13.0 (NGVD). The length of this alternative would be 4,140 feet.

Major Project Features

A6. **Criteria**. The following design references were used;

EM 1110-2-2504, DESIGN OF SHEET PILE WALLS
EM 1110-2-1913 DESIGN AND CONSTRUCTION OF LEVEES
ACI Code
These Engineering Manuals will be followed during the remaining stages of design as will EM 1110-2-2104 STRENGTH DESIGN FOR REINFORCED-CONCRETE HYDRAULIC STRUCTURES

The floodwall section was analyzed for the following conditions:

1. Freestanding wall height: 10.0 feet
2. Top of wall elevation: 12.0
3. Ground elevation: 2.0
4. Foundation elevation: -10.0 (not including key)
5. Flood level: 12.0
6. Material: Reinforced Concrete

A7. **Levees and Floodwalls.** Levees and floodwalls comprise the majority of the line of protection for the Woodbridge River project, and represent one of the most significant construction features of the project.

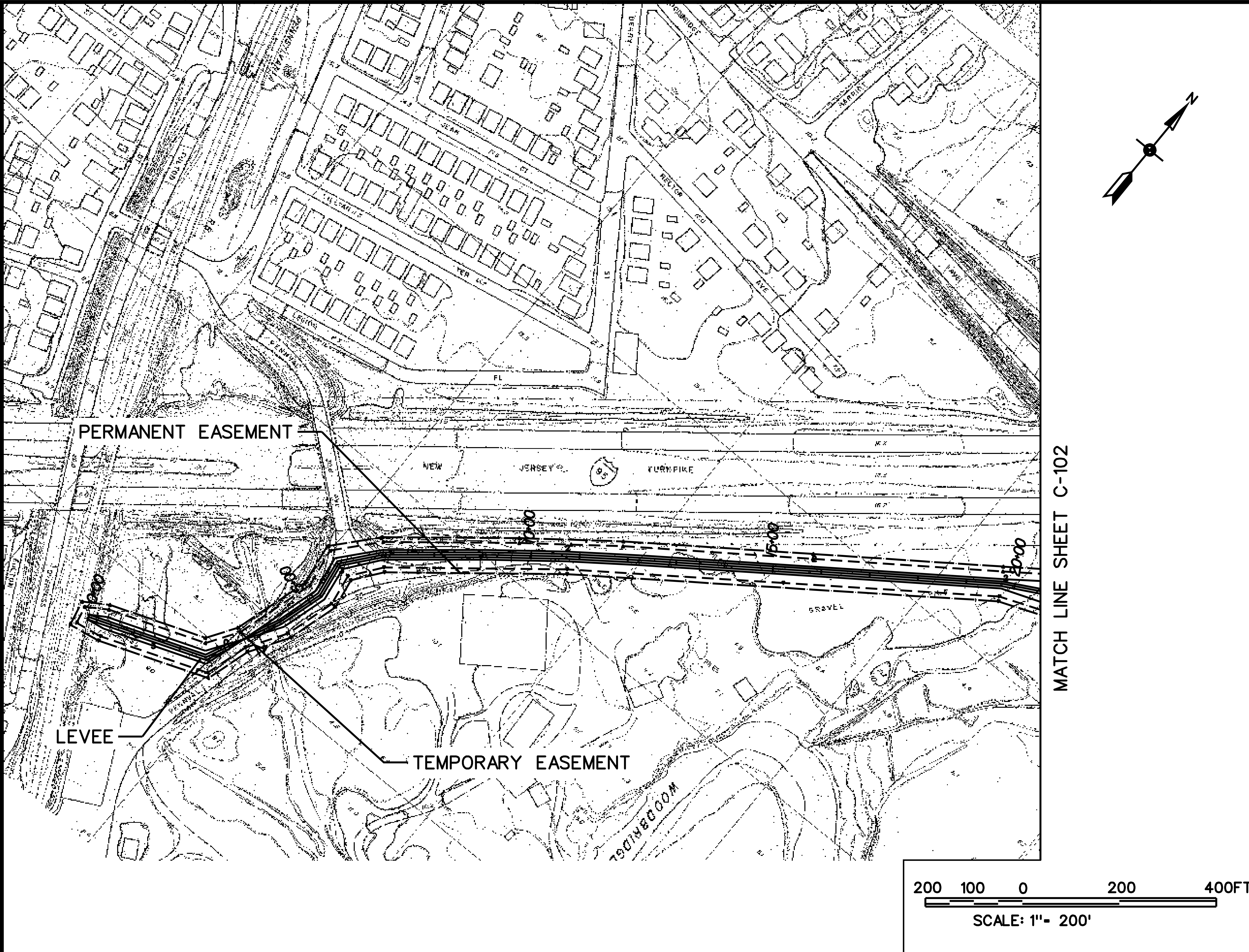
A8. **Levees.** The earthen levee segments are constructed by placing select structural fill in 12" maximum lifts and compacting to 95% MDD using vibratory equipment. A typical levee section is shown in Figure C-104.

A9. **Floodwalls.** A reinforced concrete "T" wall will be cast-in-place. The two most common floodwall cross sections are shown on Figure S-302. The necessary excavation for the foundation shall vary with the required elevation needed for the wall. The wall will be formed in 20 foot segments with waterstops in all joints. Similarly, a waterstop shall be placed between the foundation and vertical segments of the wall. No joints will be allowed except at the predetermined 20 foot intervals and the foundation/wall location. A concrete key is designed into the foundation of the larger wall to help resist sliding and overturning. In this installation, the "T" wall will only be about 10 feet high at its' highest point. The wall will deflect minimally (<1/4 in) in the worst case conditions. A concrete "T" wall was used based on the limited data available for the feasibility study. A less sturdy structure may be acceptable and should be reviewed in the Final Design Phase.

A10. **Tide Gate Structures.** Tide gate structures are constructed at the intersection of the levee and the Woodbridge River. A tide gate plan is shown on Figure C-101. A diversion trench will be

dug to provide continuous stream flow during the period of gate construction and filled after the structure is completed. It will be necessary to drive timber friction piles to support the structure. The concrete structure consisting of a reinforced concrete pile cap/footing and a vertical supporting wall are formed and poured prior to levee construction. The timber pile plan is shown on Figure S-102. Slide gates are anchored to the wall after the concrete has attained sufficient strength to support the dead load. The slide gates are operated with an electric motor actuator. Power for the actuator is provided at an electric power drop/pole proximate to each gate. Slide gates were chosen over flap gates to allow flow of water in both directions. Tide gate elevation and typical sections are shown on Figures S-201 and S-301.

A11. **Road Raising.** Road raising shall be done with as little disturbance to the surrounding area as possible. It shall include adding fill or placing retaining walls to ensure a safe transition between the new roadway and the surrounding ground elevation. Road raising plan and elevations are shown on Figures B-101 and B-201.



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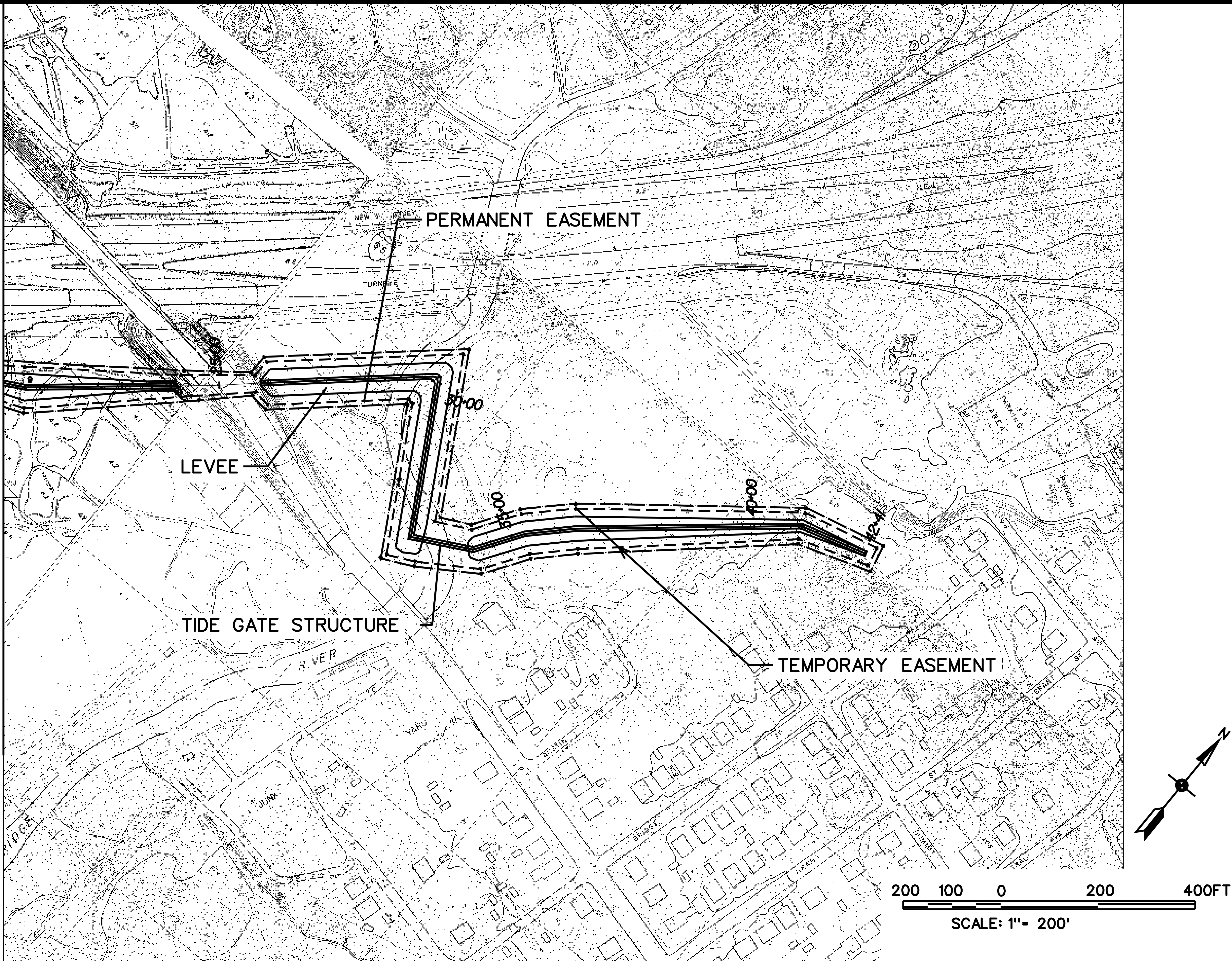
WOODBRIDGE RIVER FEASIBILITY STUDY

WOODBRIDGE, NEW JERSEY

100-YEAR LEVEL OF PROTECTION LEVEE LAYOUT SHEET 1 OF 2

Sheet reference number:

C-101



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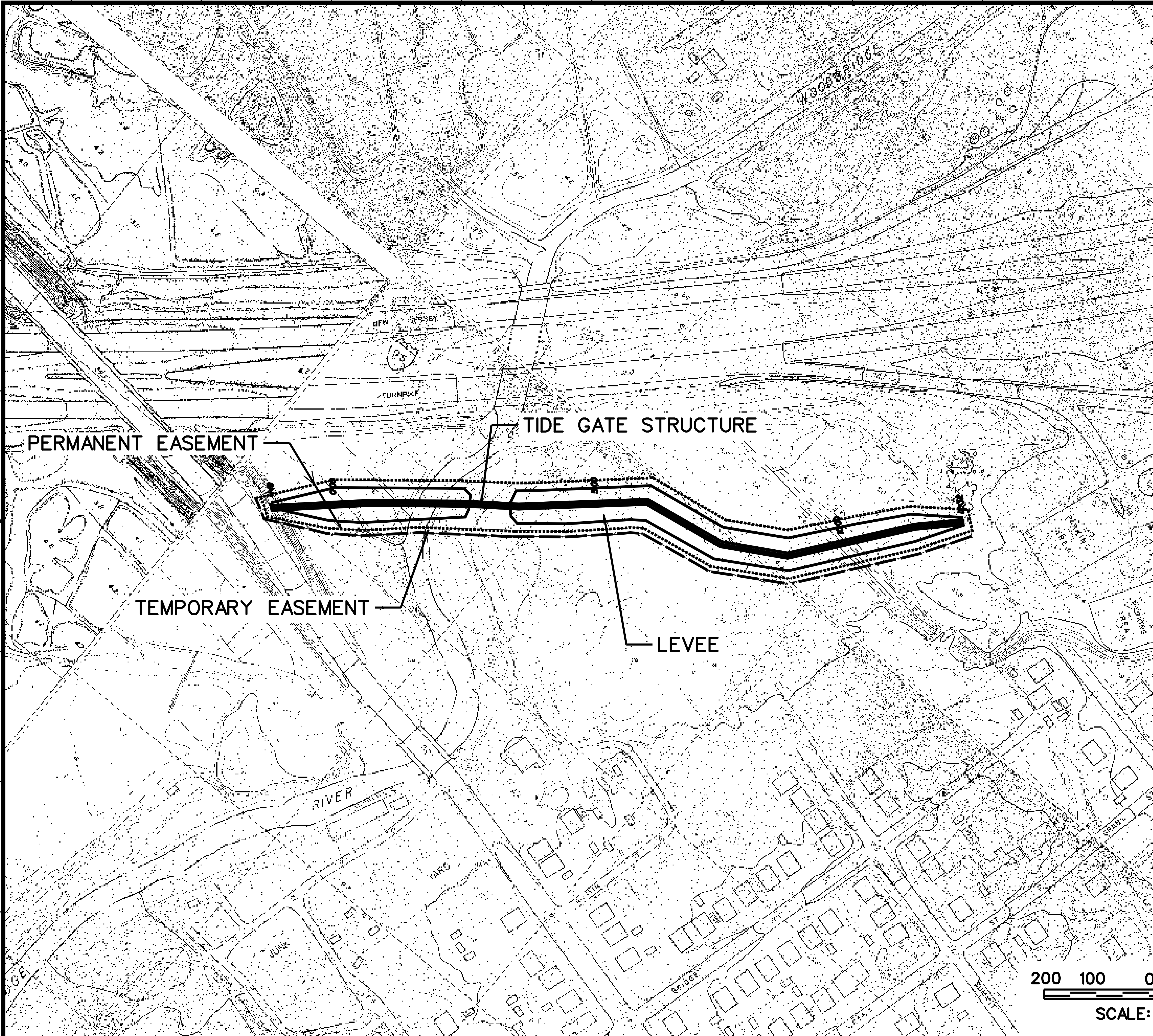
WOODBRIDGE RIVER FEASIBILITY STUDY
WOODBRIDGE, NEW JERSEY

100-YEAR LEVEL OF PROTECTION
LEVEE ALIGNMENT
SHEET 2 OF 2

Sheet reference number:
C-102
Sheet of XX



200 100 0 200 400FT

SCALE: 1"= 200'

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WOODBRIDGE RIVER FEASIBILITY STUDY
WOODBRIDGE, NEW JERSEY

LEVEE ALIGNMENT A

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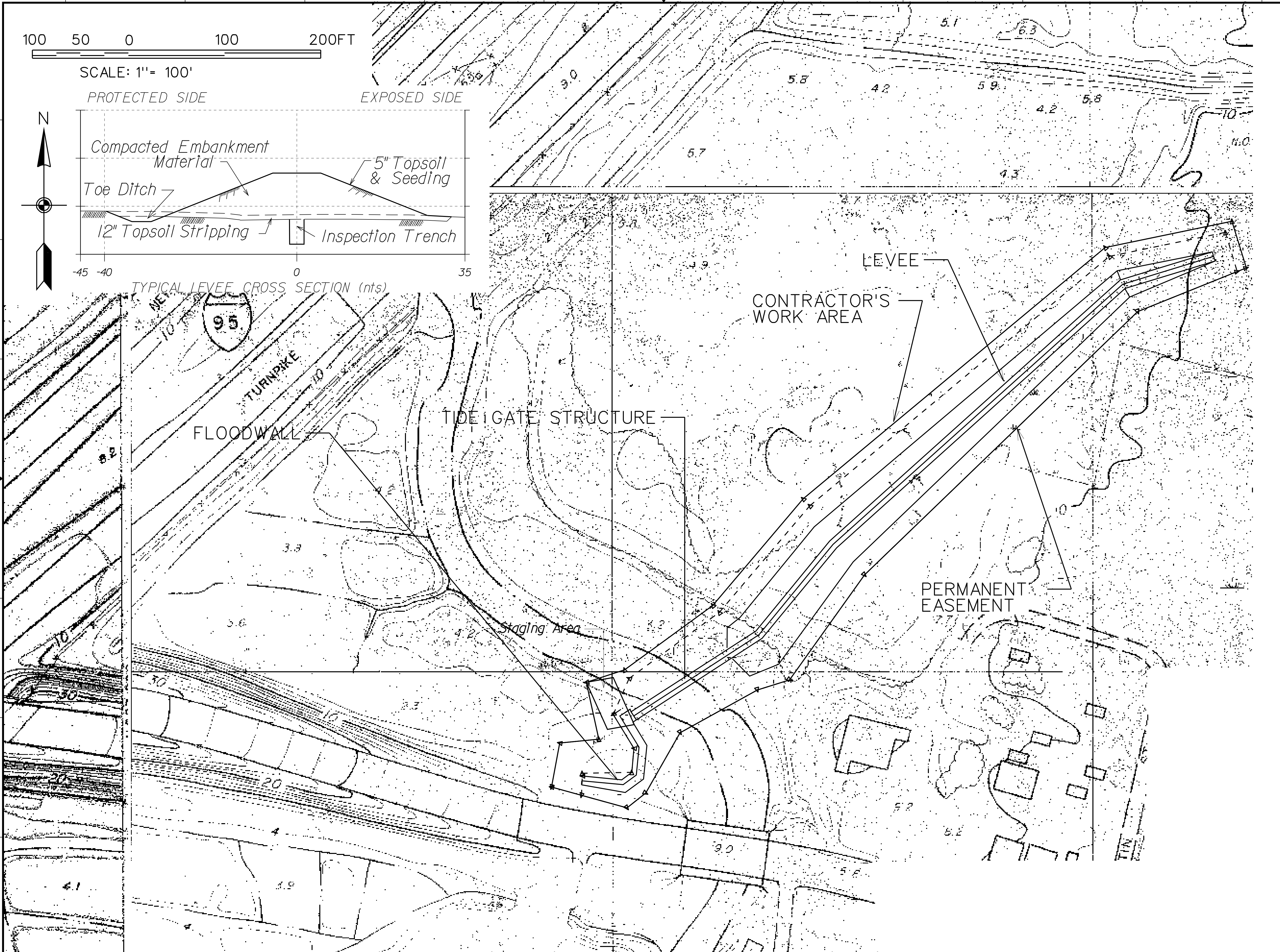
C-103
Sheet of XX



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WOODBRIDGE RIVER FEASIBILITY STUDY
WOODBRIDGE, NEW JERSEY

LEVEE ALIGNMENT C

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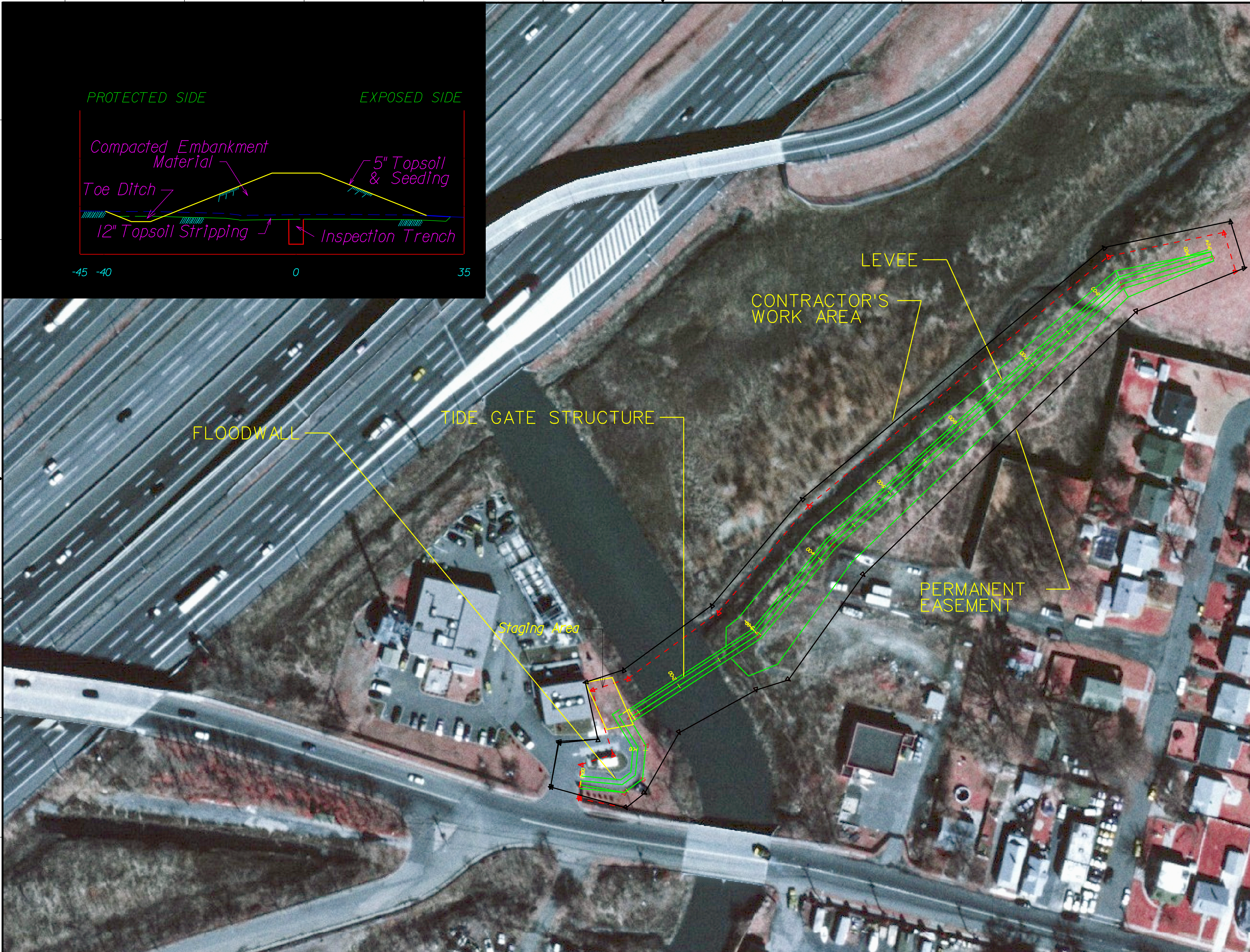
C-104
Sheet of XX



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WOODBRIDGE RIVER FEASIBILITY STUDY

WOODBRIDGE, NEW JERSEY

LEVEE ALIGNMENT C

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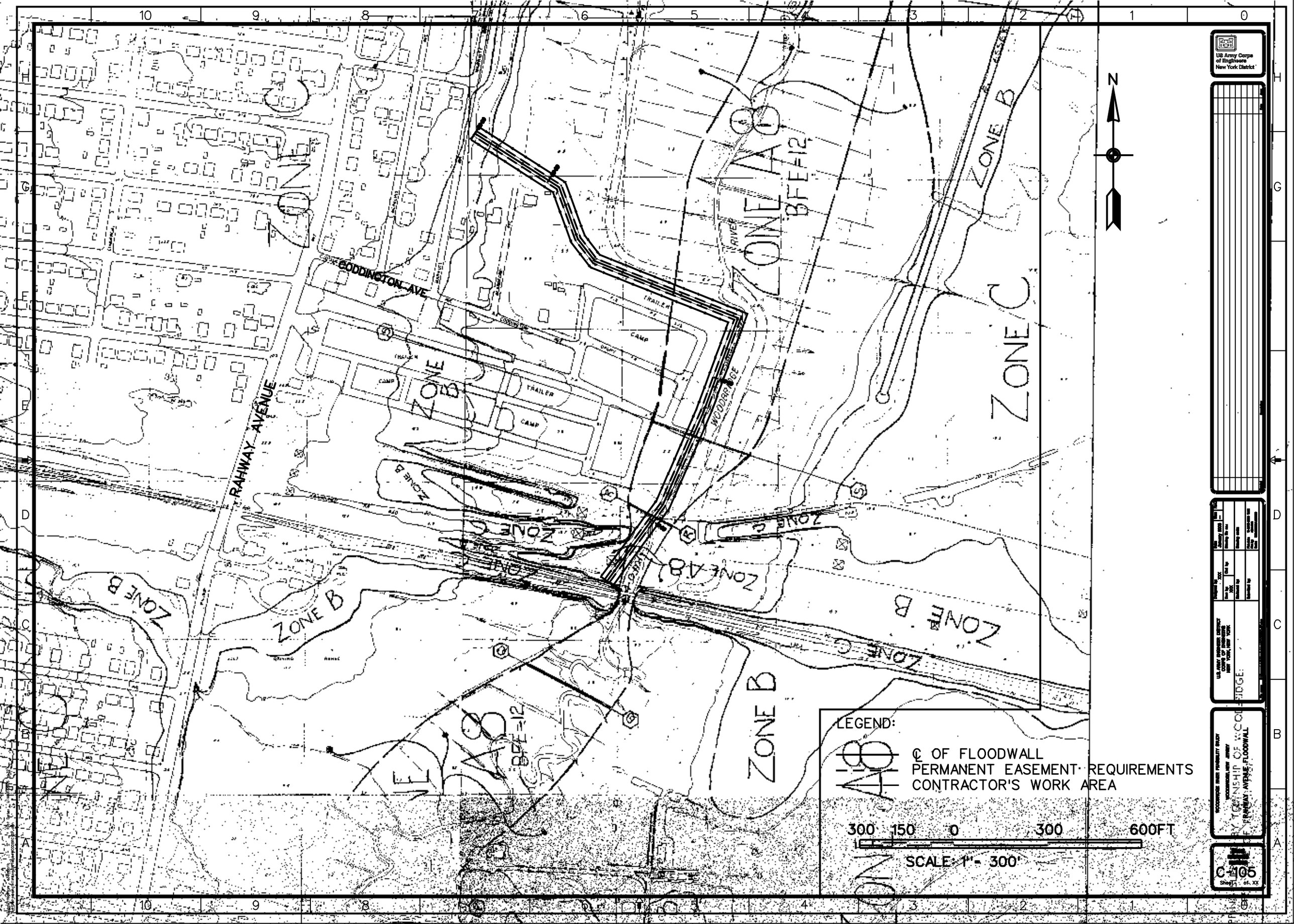
C-104a


CODDINGTON AVE
RAHWAY AVENUE
WOODBRIDGE
ZONE A
BFE 12
ZONE B
ZONE C
ZONE A8
BFE 8
TRAILER CAMP
N
LEGEND:
℄ OF FLOODWALL
PERMANENT EASEMENT REQUIREMENTS
CONTRACTOR'S WORK AREA
300 150 0 300 600FT
SCALE: 1"= 300'
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U.S. ARMY ENGINEER DISTRICT NEW YORK, NEW YORK
WOODBRIDGE RIVER FEASIBILITY STUDY
WOODBRIDGE, NEW JERSEY
RAHWAY AVENUE FLOODWALL
C-105
Sheet of XX

LEGEND:

- ℄ OF FLOODWALL
- PERMANENT EASEMENT REQUIREMENTS
- CONTRACTOR'S WORK AREA
- ROAD RAISING

PORT READING AVENUE

CRAMPTON AVENUE

RAHWAY AVENUE

N

300 150 0 300 600FT

SCALE: 1"= 300'

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WOODBRIDGE RIVER FEASIBILITY STUDY

WOODBRIDGE, NEW JERSEY

CRAMPTON AVENUE FLOODWALL

C-106

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WOODBRIDGE FLOOD CONTROL PROJECT
WOODBRIDGE, NEW JERSEY

PORT READING ROAD RAISING PLAN VIEW

Sheet reference number: **B–101**

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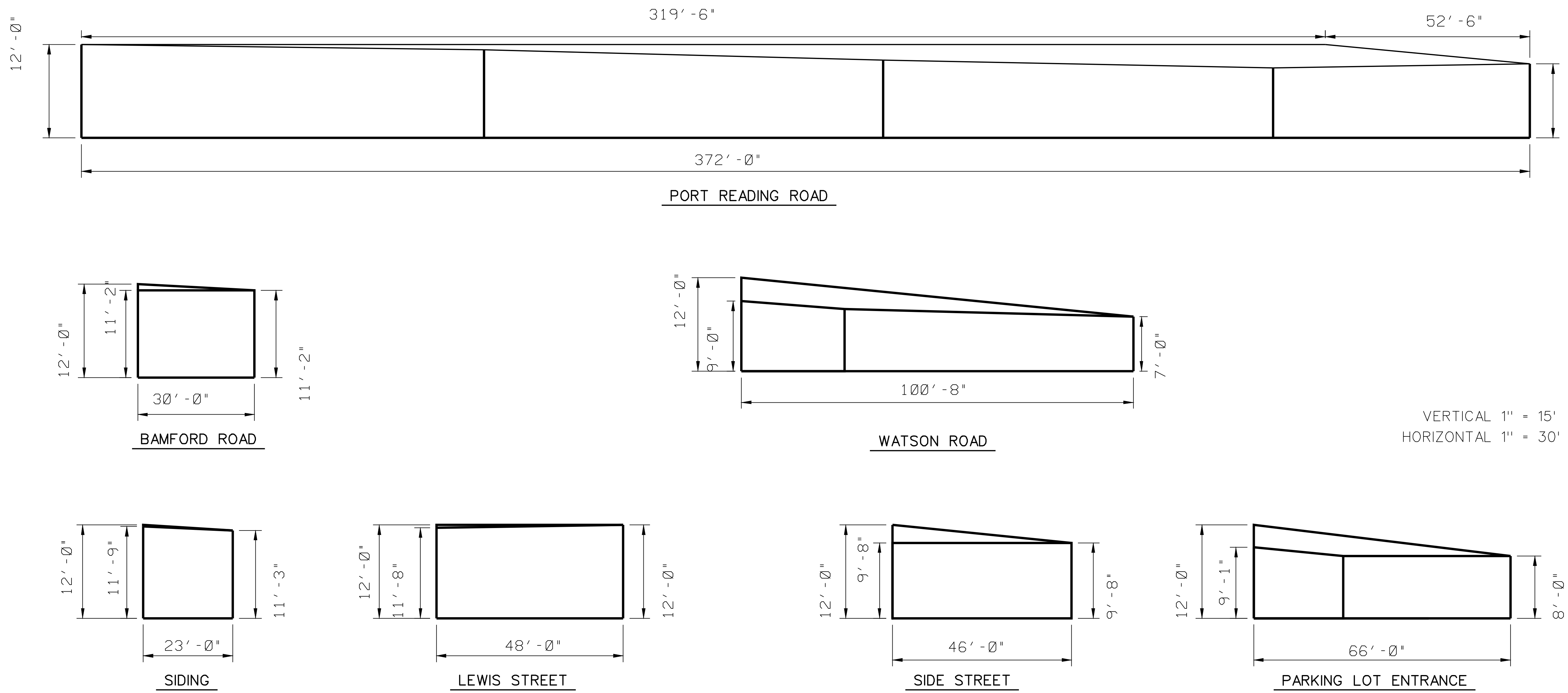

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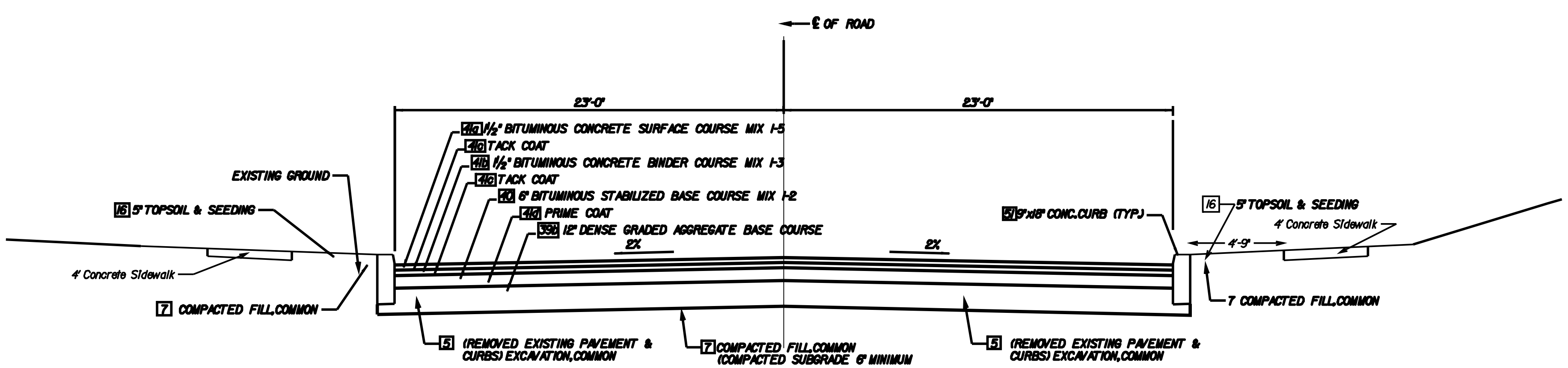
HORIZONTAL 1" = 30'



TYPICAL ROAD CROSS-SECTION

NOT TO SCALE

DRAFT

NOTES:

1. EXISTING PAVEMENT SHALL BE REMOVED TO TOP OF AGGREGATE BASE COURSE. SUFFICIENT BASE COURSE SHALL BE ADDED TO ACHIEVE REQUIRED TOP COURSE ELEVATION.
2. ALL EXISTING MANHOLES SHALL HAVE RISERS ADDED TO MEET NEW TOP COURSE ELEVATION.
3. ALL INLETS AND CATCH BASINS SHALL BE REMOVED AND RESET TO MEET NEW TOP COURSE ELEVATION.

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WOODBRIDGE FLOOD CONTROL PROJECT
WOODBRIDGE, NEW JERSEY

ROAD RAISING PROFILES

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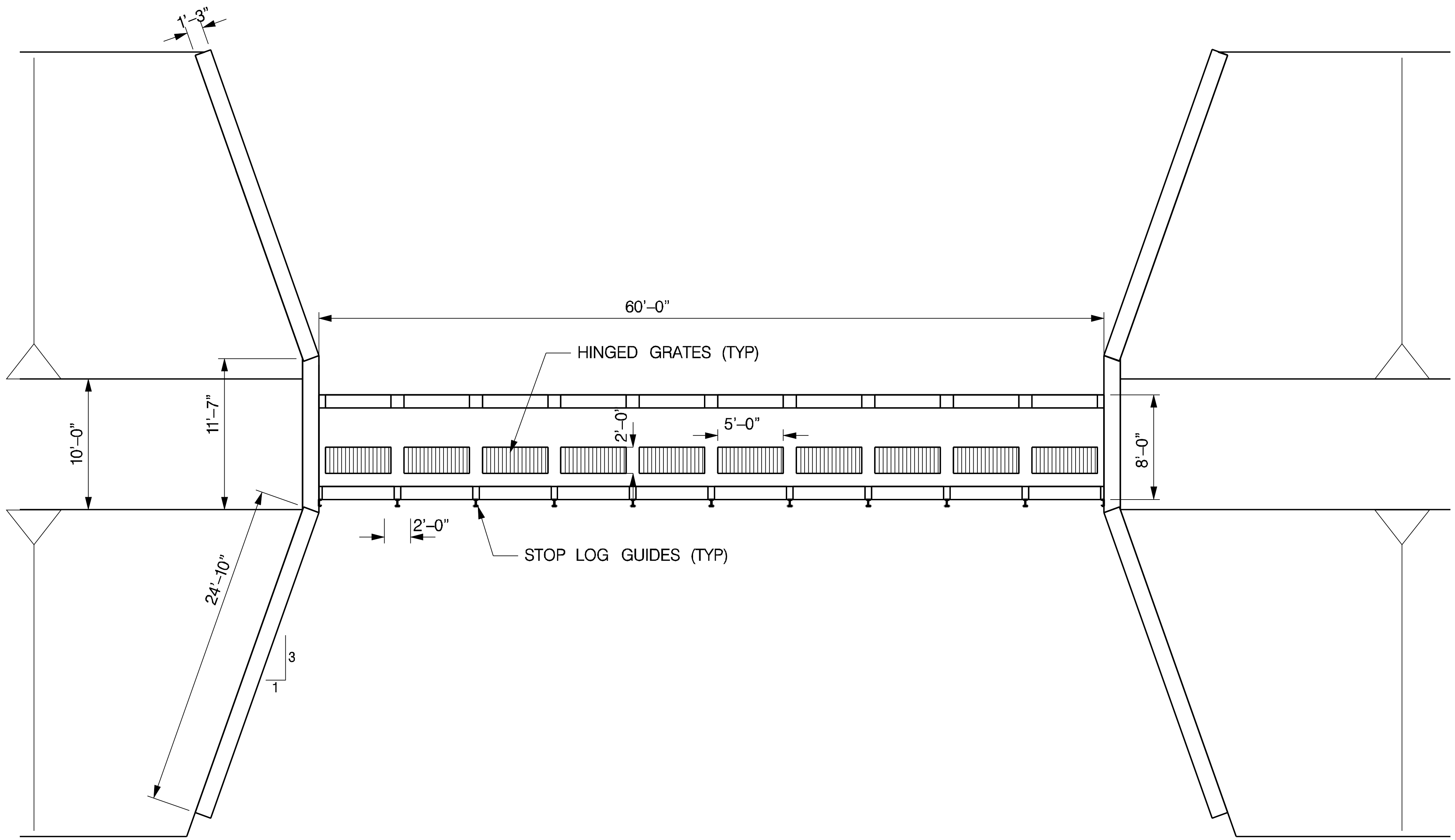

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5FT 0 1 2 3 4 5 10FT

SCALE: 1"= 10'

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WOODBRIDGE FLOOD CONTROL PROJECT
WOODBRIDGE, NEW JERSEY

TIDE GATE PLAN

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S-101

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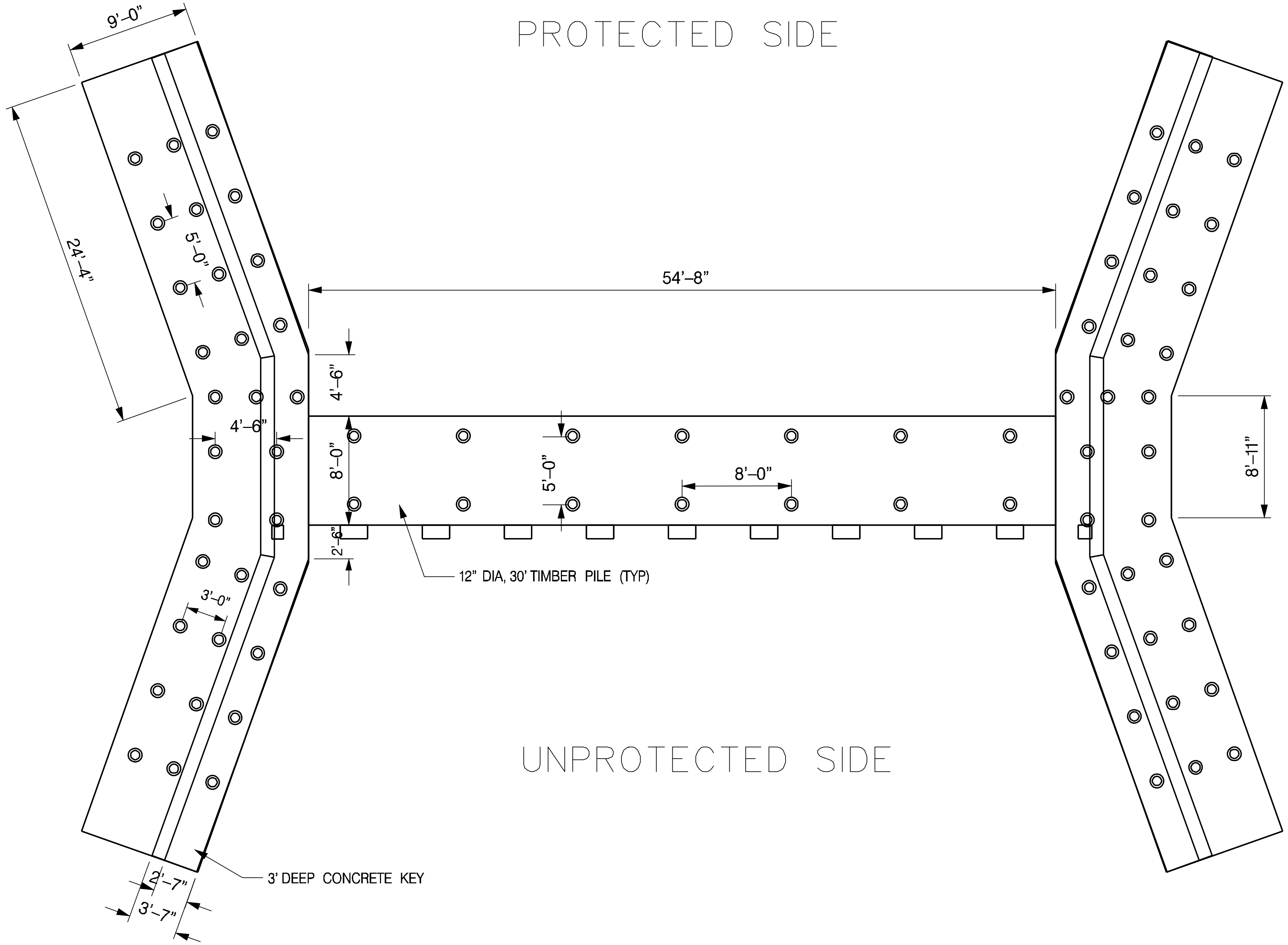

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SCALE: 1"= 10'

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WOODBRIDGE FLOOD CONTROL PROJECT
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PILE AND PILE CAP PLAN SHEET

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S-102

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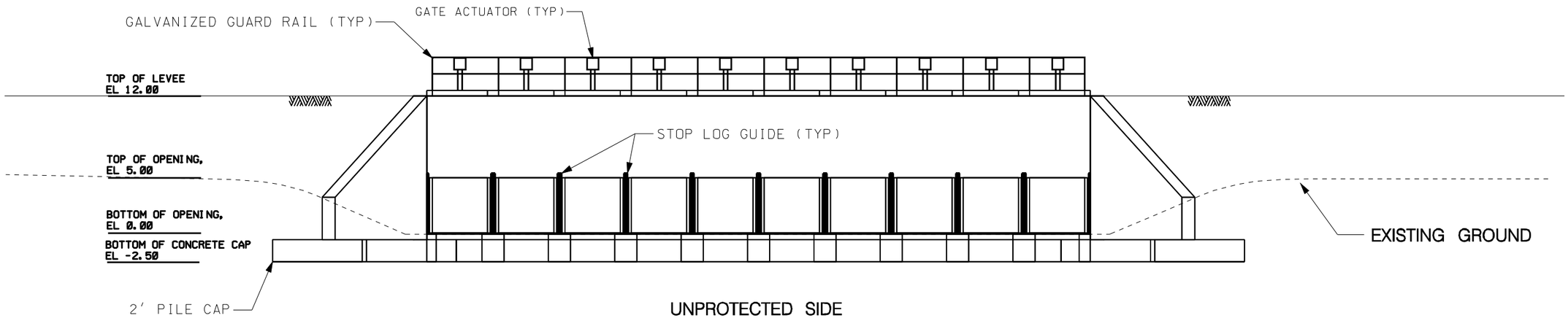

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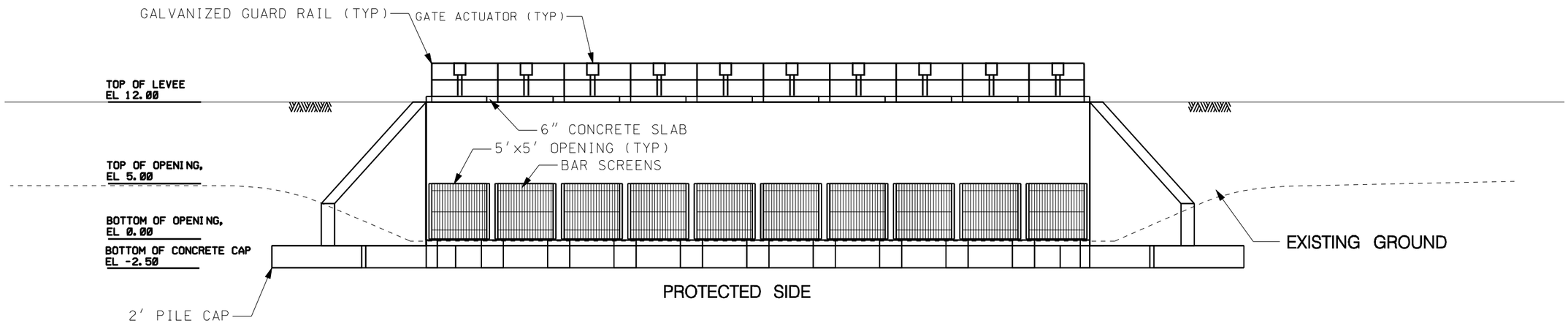

PROTECTED SIDE

NOTES:
PILES AND KEY NOT SHOWN FOR CLARITY

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5FT 0 1 2 3 4 5 10FT

SCALE: 1"= 10'

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TIDE GATE ELEVATION

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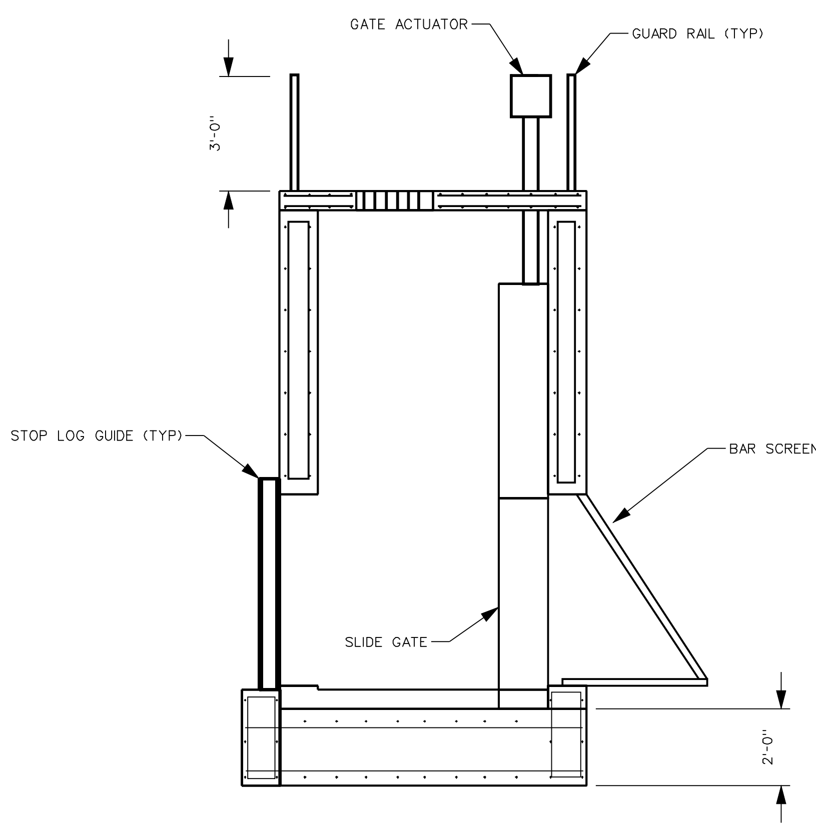

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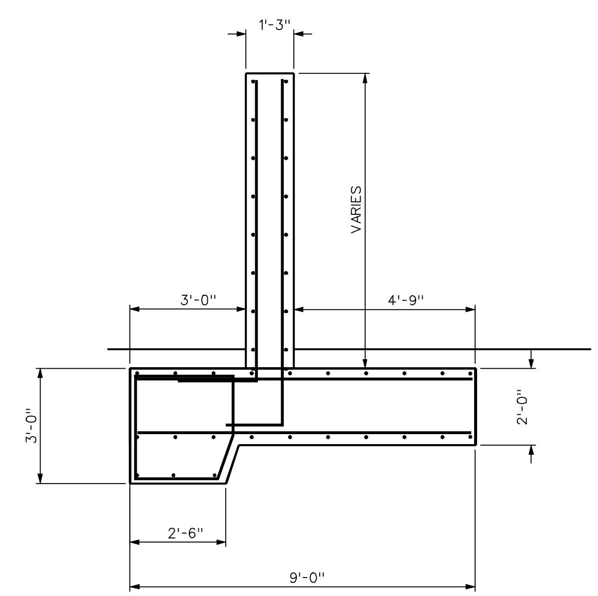

TYPICAL WING WALL SECTION

2FT 0 1 2 3 4 5FT

SCALE: 1"= 5'

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WOODBRIDGE FLOOD CONTROL PROJECT
WOODBRIDGE, NEW JERSEY

TYPICAL SECTIONS

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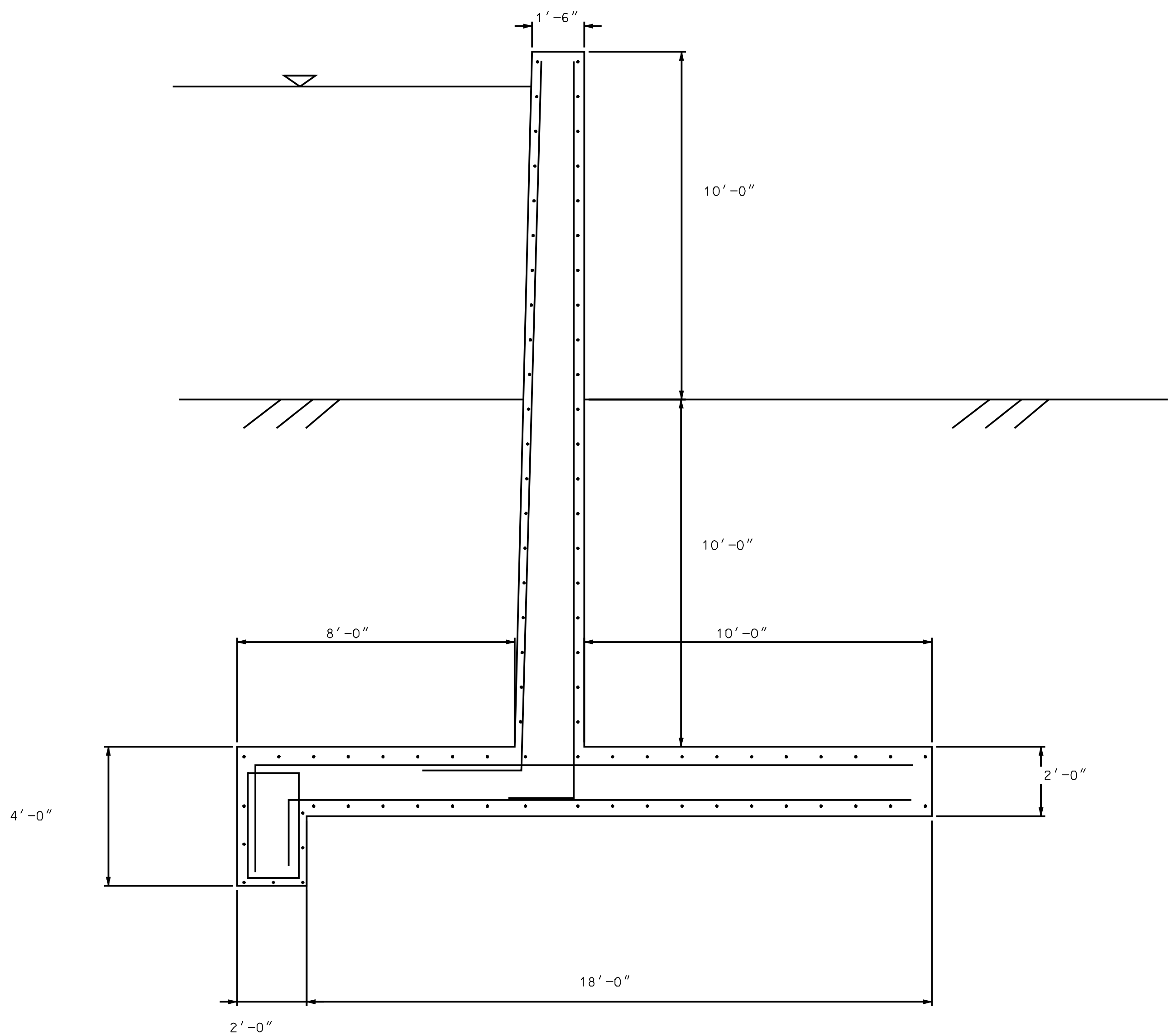
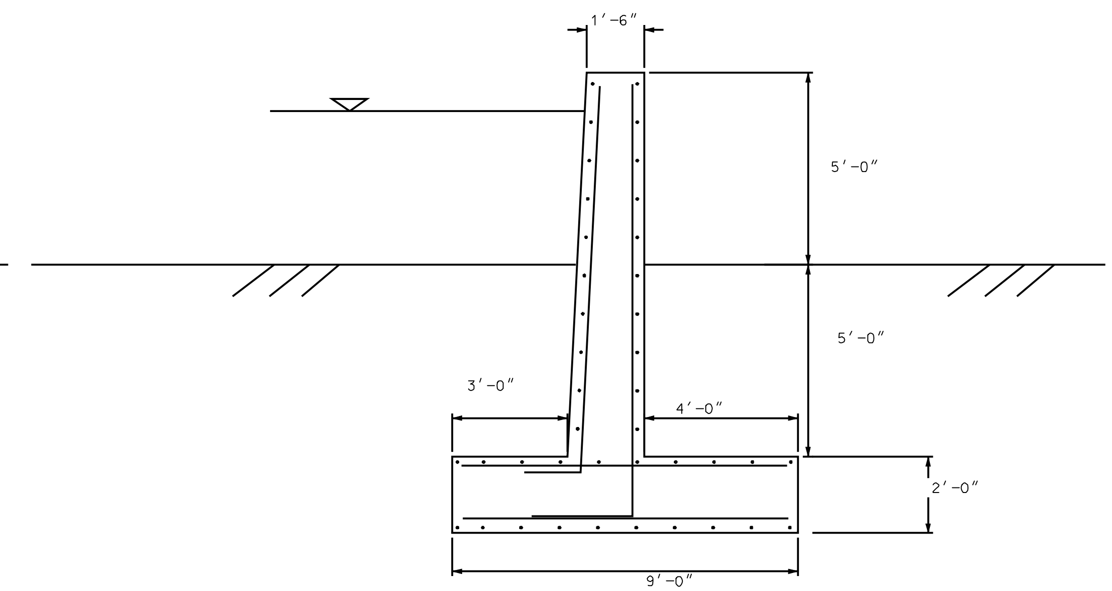


10′ FLOOD WALL



4′ FLOOD WALL

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2FT 0 1 2 3 4 5FT
SCALE: 1″= 5′

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WOODBRIDGE FLOOD CONTROL PROJECT
WOODBRIDGE, NEW JERSEY

FLOODWALL SECTIONS

Sheet reference number:
S-302

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